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ABSTRACT

It is claimed that, properly organized, management information systems not only can contain all the data within a total organization, but can refine and arrange the information so that it becomes meaningful to the decisionmaker. At present their functions are virtually restricted to middle management, operational control levels. However, the rapid growth of both hardware and software promises very soon to come to the aid of upper management for strategic planning and policymaking as well. The review examines the nature of these new computer-based management information systems and their contribution to educational decisionmaking. It stresses the need for careful definition of problems and for planning before engaging in MIS development, while raising the question of the role of management information systems within the total system. (Author)

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Management Information Systems

Warren Mellor

The accelerating pace of technological change and other major long-term trends are having an increasingly profound impact on the way the educational system is organized and on the role played by its managers (Rosove 1968). MIS technology is creating unprecedented opportunities to manage and distribute information—hierarchically and geographically—to a place and at a time convenient to both manager and learner. These new opportunities will create pressures to organize and deliver educational services in ways vastly different from those practiced in the past (Silberman 1966 and "Reading, Writing and Profit" 1969).
Evans (1970a)

In an "information-rich" society, there is no lack of data on almost any topic you can name. In many instances the problem is to detect the information that is not relevant to the decision in hand.

Management information systems (MIS) lay claim to solving that problem. Properly organized, management information systems not only can contain all the data within a total organization, but can refine and arrange the information so that it becomes meaningful to the user. At present their functions are virtually restricted to middle management, operational control levels. But the rapid growth of both hardware (machines) and software (programming languages) promises very soon to come to the aid of upper management for strategic planning and policy-making as well.

Even though costs are dropping dramatically, however, use of computerized data processing facilities is still beyond

the reach of any but the biggest school districts. For this reason, many superintendents are cooperating in the development of regional centers and are finding that costs are reduced without any loss of local autonomy.

This review examines the nature of these new computer-based management information systems and their contribution to educational decision-making. It stresses the need for careful definition of problems and for planning before engaging in MIS development. And it raises the question of the role of management information systems within the total system.

Of the documents reviewed, fifteen are available from the ERIC Document Reproduction Service. Complete instructions for ordering are given at the end of the review.

DECISION-MAKING

An educational management information system (MIS) provides data to help managers make decisions (Evans 1970a). It integrates and coordinates the various organizational functions from different levels, different places, and different times.

The MIS system is a network of communication channels, information sources, computer storage and retrieval devices, and processing routines. Earlier, noncomputer-based systems relied on in/out boxes and telephones. But the technological revolution has allowed computers to do the old jobs faster and the new jobs differently. New input/output devices such as display consoles have been added.

MIS Components

Data / Information

Personnel

Display / Communications

Equipment / Hardware

Programming / Software

Witkin (1971)

Lewis (1967) notes seven phases that managers go through in making decisions:

1. initiation
2. comprehension of the situation
3. consideration of all relevant factors
4. confirmation of the objectives
5. choosing the best solution
6. communicating this choice
7. consequences of the choice

Four of these (points 1, 2, 6, and 7) relate to the flow of information to and from the manager. The information system thus augments management's ability to select the best objectives, plans, programs, resource allocations, and schedules from a great number of alternatives.

The applications of management information tools to education are at present similar to their applications in industry (Evans 1970a). Most activity is taking place at the operational control level, with emphasis on financial and business matters. Decisions at this level are more structured, hence their information requirements are more easily identified. There have been some inroads into the level of management control, but very few (such as operations research) into strategic planning.

The decision-making process is thus viewed as a three-level hierarchy:

strategic planning—deciding on the objectives of an organization, on resources to obtain these objectives, and on policies governing their use and attainment. This occurs primarily at state department and board of education levels.

management control—efficient procurement and utilization of resources. It is carried out chiefly by superintendents, assistant superintendents, and principals.

operational control—assuring that specific tasks are carried out effectively and efficiently. This particularly concerns teachers and specialist support personnel.

DESIGN CONSIDERATIONS

Opportunities for increasing educational flexibility are provided by management information systems. The educator, according to Evans (1970a), has any number of options in hardware and software computer technology. He can gain assistance in carrying out six management functions, although greatest support so far has come in the areas of resource management and operational control.

Management Functions Aided by MIS

- Needs assessment
- Resource management
- Logistics
- Planning
- Operational control
- Evaluation

Evans (1970a)

The fundamental reason for the lack of computer aid to the other management functions is that effective needs assessment, planning, and evaluation can be undertaken only after goals and objectives have been clearly identified. Adequate identification of goals and objectives depends on ability to define the problems.

Lewis (1967) stresses this issue in dealing with the design of management information systems themselves. The first stage in the process is to define the problem. Such definition will

- examine the problem in terms of its environment
- determine the user's information requirements
- determine the speed of response requirements of the system
- select the optimum combination of mental efforts, equipment, and procedures within the cost frame established for the system

A study that has explored the extent to which large amounts of data can be reduced meaningfully is reported by Kowitz and others (1970). An attempt was made to isolate those factors that most aptly describe the state of the school system. Forty-six items were selected as representing typical school administration data. Analyses of the data revealed school size and education costs to be primary factors in describing school systems.

MIS IN OPERATION

Educational administrators have been slow to implement computerized data processing (Bumsted 1969). Perhaps they fail to understand information systems, or possibly systems planning has been neglected.

Nonetheless, population growth and the changing role of education in the future will necessitate computerized data handling. Probably the most important reasons for the slow diffusion of computer systems applications into education are cost, the lack of working models, and inadequate dissemination of the results achieved by successful data processing installations.

Data processing personnel, who are in a unique position for guiding educators in handling information, should be given greater roles to play in decision-making. They will provide data for managerial direction and control, analytical assistance in the evaluation of programs and concepts, support in revising established practices and in introducing innovations, faster and more effective information dissemination and interdepartmental communication, and ongoing evaluation of the management information system itself.

Lewis (1967) sees the purposes of these systems as

- delivery of information when and where it is needed in a timely and accurate manner
- filtering the distribution of information
- efficient assembling of information for special reports
- execution, through its internal logic, of as many controls as are feasible

The Oregon Total Information System (OTIS) provides student, business, and instructional services to fifty school districts (Hoag 1973). From 119 on-line terminals, some 250 schools throughout Oregon are connected to three computers in Eugene. The service, available ten hours a day, handles 3,000 inputs per hour. Cost to the schools for administrative services is about $8.80 per student per year.

On-line questions regarding information in files can be answered by GEMS (General Education Management System), a specially tailored management system offered by OTIS for school officials. GEMS employs five data files (students, staff, curriculum, property, and finances). These files are integrated, that is, information entered in one automatically updates other pertinent files.

GEMS will supply access to whatever files are necessary to respond to the user's query. In this way OTIS not only accesses and manipulates data (for reports and other related purposes), but also provides assistance with planning and decision-making.

The fourth generation of computer hardware presently emerging will provide greater computing complexity without a great increase in cost (Smith 1970). As yet, there are few full-fledged stable and really profitable management information systems known, but the benefits from a properly working system seem worth the effort. Operations research is building an integrated approach to the place of information systems in the managerial decision process.

Implementing Total Systems

Lewis (1967) observed that most management information systems current at the time of his writing did not constitute total systems. Rather they were merely an integration of several subsystems. He saw a need to specify the relationship of MIS to other systems within the organization and commented that MIS have so far had their greatest success in highly centralized organizations. Vertical and horizontal integration of the various types of systems related to MIS, says Evans (1970a),

will break down organizational isolation and allow closer interaction of all the component parts.

Stages in MIS Implementation

Problem definition

Team organization and planning

Preliminary design

Principal design

Equipment selection

Implementation

Test and evaluation

Lewis (1967)

Witkin (1971) suggests some considerations in designing and operating such systems. A framework for management information systems can be devised that takes into account other system approaches, such as Planning-Programming-Budgeting Systems, Program Evaluation and Review Technique, and Critical Path Method.

A monograph produced by the New England School Development Council (1972) includes an organizational chart showing the relationships not only among computer personnel, but also between other organizational personnel and the computer facility. The study outlines the experiences of one school district when a computer capability was acquired. It observes and documents the procedures commonly used by most schoolmen as they make decisions about computer technology in the schools.

A step-by-step approach by which a computer capability can be established and then later expanded discusses issues such as computer hardware, the role of administrative personnel and inservice training, and implementation of the system.

In a paper distributed to the California educational administrators participating in Operation PEP (Prepare Educational Planners), Evans (1970b) provides a comprehensive outline of the efforts involved in the evolutionary development of management information systems. The particular focus is on organizational problem-finding and planning. The developmental process, from needs recognition to evolving MIS operational capabilities, must be tailored to available funds and time.

Part 2 of the same paper (Evans 1970c) recommends a process that facilitates coordination of other internal and external organizational functions in order to reduce risk, time, and cost. Evans focuses on some of the major aspects of design synthesis and integrated planning used in developing, acquiring, and implementing MIS. Such aspects are also fundamental to an ongoing improvement of the MIS once it has been established.

SUPPLEMENTARY MATERIALS

Those who wish to read further on the concept, design, and applications of management information systems will find many stimulating and wide-ranging ideas among the following references.

- **Mason and Mitroff** (1973)—a suggested program of research into MIS variables
- **Barnett** (1971)—four papers on developing MIS
- **Zegarac and others** (1971)—bibliography on the development of comprehensive information systems
- **Burrows** (1970)—introduction to basic concepts in information technology
- **ERIC/Clearinghouse on Educational Management** (1970)—analysis and bibliography of MIS applications to educational management

- **Lewis** (1970)—examines data processing applications of MIS
- **Ross and Murdick** (1970)—annotated bibliography
- **Summers and Sullivan** (1970)—outline of computer capabilities
- **Evans** (1968)—schematic representation of the development of MIS
- **Henderson** (1967)—literature survey on the evaluation of information systems
- **Kaimann and Marker** (1967)—anthology of materials on information systems and the effects of automation on education
- **Loughary and Tondow** (1967)—report of a conference on the future requirements of educational information systems
- **Piele** (1967)—catalog of journal articles on educational data processing

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